

U.S. Patent Application No. 09/995,888
Amendment dated September 8, 2004
Reply to Office Action dated June 28, 2004

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (currently amended): A filter cartridge assembly comprising:

a tubular housing having an inner wall, an outer wall, a first end, and a second end, said inner wall including at least a first section, a second section, and a third section, said first section having a first length in a direction from said first end to said second end and a first average inner diameter, said second section having a second length in a direction from said first end to said second end and a second average inner diameter that is smaller than said first average inner diameter, said third section having a third length in a direction from said first end to said second end and a third average inner diameter that is smaller than said second average inner diameter, wherein the inner wall of said tubular housing includes a first shoulder at the intersection of said first section and said second section and a second shoulder at the intersection of said second section and said third section; and

a plurality of filter media sections, ~~including a first filter media section~~, within the tubular housing and radially contained by said inner wall, each of said plurality of filter media sections having a ~~different~~ filter media composition, wherein ~~said first~~ at least one of said plurality of filter media section sections has a length in a direction from said first end to said second end that includes at least portions of at least two of said lengths of the inner wall sections such that said ~~first~~ at least one of said plurality of media section sections traverses at least one of said shoulders.

Claim 2 (original): The assembly of claim 1, wherein said assembly further comprises:

a first connector that seals the first end of said tubular housing except at a centrally-located entrance port in said connector where fluid is capable of entering the assembly; and

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a second connector that seals the second end of said tubular body except at a centrally-located exit port where fluid is capable of exiting the cartridge.

Claim 3 (original): The assembly of claim 2, wherein said assembly further contains a dialysate fluid.

Claim 4 (original): The assembly of claim 2, wherein said tubular housing comprises a plastic material.

Claim 5 (original): The assembly of claim 4, wherein said plastic material comprises a polypropylene material.

Claim 6 (original): The assembly of claim 1, wherein the thickness of said inner wall is less than, or equal to, about 0.125 inch.

Claim 7 (currently amended): The assembly of claim 1, wherein said at least one of said plurality of first filter media section sections traverses said first shoulder, ~~said plurality wherein at least another one of said plurality of filter media sections includes a second filter media section, said second filter media section has a different filter media composition than said first~~ at least one of said plurality of filter media section sections, said ~~second~~ at least another one of said plurality of filter media section sections has a length in a direction from said first end to said second end that includes at least portions of said second length and said third length of said inner wall sections, and said ~~second~~ at least another one of said plurality of filter media section sections traverses said second shoulder.

Claim 8 (original): A system including the assembly of claim 2, in combination with a fluid circulating device, wherein said device has an outlet and an inlet, said entrance port is in fluid communication with said outlet, and said exit port is in fluid communication with said inlet.

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Claim 9 (original): A method of filtering a fluid, comprising circulating said fluid through the system of claim 8.

Claim 10 (original): A method of preparing the assembly of claim 2, comprising:

providing said tubular housing;

sealing one of said first and second end connectors to said tubular housing;

introducing a first of said filter media sections into said tubular housing;

settling said first media section in said tubular housing; and

sealing the other of said first and second connectors to said tubular body.

Claim 11 (original): A filter cartridge housing comprising:

a tubular housing having a conical shape and including a straight inner wall, an outer wall, a first end, and a second end, said inner wall including at least a first section, a second section, and a third section, said first section having a first length in a direction from said first end to said second end and a first average inner diameter, said second section having a second length in a direction from said first end to said second end and a second average inner diameter that is smaller than said first average inner diameter, said third section having a third length in a direction from said first end to said second end and a third average inner diameter that is smaller than said second average inner diameter; and

a first annular flow director extending radially inwardly from the inner wall of said tubular housing at the intersection of said first section and said second section, and a second annular flow director extending radially inwardly from the inner wall at the intersection of said second section and said third section.

Claim 12 (currently amended): An assembly comprising:

the filter cartridge housing of claim 11; and

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a plurality of filter media sections, ~~including a first filter media section~~, within the tubular housing and radially contained by said inner wall, each of said plurality of filter media sections having a ~~different~~ filter media composition, wherein ~~said first~~ at least one of said plurality of filter media section sections has a length in a direction from said first end to said second end that includes at least portions of at least two of said lengths of the inner wall sections such that said ~~first~~ at least one of said plurality of filter media section sections traverses at least one of said first and second annular flow director.

Claim 13 (original): The assembly of claim 12, wherein said assembly further comprises:

a first connector that seals the first end of said tubular housing except at a centrally-located entrance port in said connector where fluid is capable of entering the assembly; and

a second connector that seals the second end of said tubular body except at a centrally-located exit port where fluid is capable of exiting the cartridge.

Claim 14 (original): The assembly of claim 13, wherein said assembly further contains a dialysate fluid.

Claim 15 (original): The filter cartridge housing of claim 11, wherein said tubular housing comprises a plastic material.

Claim 16 (original): The filter cartridge housing of claim 15, wherein said plastic material comprises a polypropylene material.

Claim 17 (previously presented): The filter cartridge housing of claim 1, wherein the thickness of said inner wall is less than, or equal to, about 0.125 inch.

Claim 18 (currently amended): The assembly of claim 12, wherein said ~~first~~ at least one of said plurality of filter media section sections traverses said first annular flow director, ~~said plurality of wherein at least another one of said plurality of filter media sections includes a second filter~~

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~~media section, said second filter media section~~ has a different filter media composition than said first at least one of said plurality of filter media section sections, said ~~second~~ at least another one of said plurality of filter media section sections has a length in a direction from said first end to said second end that includes at least portions of said second length and said third length of said inner wall sections, and said ~~second~~ at least another one of said plurality of filter media section sections traverses said second annular flow director.

Claim 19 (original): A system including the assembly of claim 13, in combination with a fluid circulating device, wherein said device has an outlet and an inlet, said entrance port is in fluid communication with said outlet, and said exit port is in fluid communication with said inlet.

Claim 20 (original): A method of filtering a fluid, comprising circulating said fluid through the system of claim 19.

Claim 21 (currently amended): A method of preparing the assembly of claim 13, comprising:

providing said tubular housing;

sealing one of said first and second end connectors to said tubular housing;

introducing ~~a first of~~ at least one of said plurality of said filter media sections into said tubular housing;

settling said ~~first~~ at least one of said plurality of filter media section sections in said tubular housing; and

sealing the other of said first and second connectors to said tubular body.

Claim 22 (currently amended): A filter cartridge assembly comprising:

a filter cartridge housing including a tubular housing having a cylindrical shape of constant inner diameter and including a straight inner wall, an outer wall, a first end, and a

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second end, said inner wall including at least a first section, a second section, and a third section, said first section having a first length in a direction from said first end to said second end, said second section having a second length in a direction from said first end to said second end, said third section having a third length in a direction from said first end to said second end;

a first annular flow director extending radially inwardly from the inner wall of said tubular housing at the intersection of said first section and said second section, and a second annular flow director extending radially inwardly from the inner wall at the intersection of said second section and said third section; and

a plurality of filter media sections, ~~including a first filter media section~~, within the tubular housing and radially contained by said inner wall, each of said plurality of filter media sections having a ~~different~~ filter media composition, wherein ~~said first~~ at least one of said plurality of filter media section sections has a length in a direction from said first end to said second end that includes at least portions of at least two of said lengths of the inner wall sections such that said ~~first~~ at least one of said plurality of media section sections traverses at least one of said first and second annular flow director.

Claim 23 (original): The filter cartridge assembly of claim 22, wherein said assembly further comprises:

a first connector that seals the first end of said tubular housing except at a centrally-located entrance port in said connector where fluid is capable of entering the assembly; and

a second connector that seals the second end of said tubular body except at a centrally-located exit port where fluid is capable of exiting the cartridge.

Claim 24 (original): The filter cartridge assembly of claim 23, wherein said assembly further contains a dialysate fluid.

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Claim 25 (original): The filter cartridge assembly of claim 22, wherein said tubular housing comprises a plastic material.

Claim 26 (original): The filter cartridge assembly of claim 25, wherein said plastic material comprises a polypropylene material.

Claim 27 (original): The filter cartridge assembly of claim 22, wherein the thickness of said inner wall is less than, or equal to, about 0.125 inch.

Claim 28 (currently amended): The filter cartridge assembly of claim 22, wherein said ~~first~~ at least one of said plurality of filter media section sections traverses said first annular flow director, wherein at least another one of said plurality of filter media sections includes a second filter media section, said second filter media section has a different filter media composition than said first at least one of said plurality of filter media section sections, said second at least another one of said plurality of filter media section sections has a length in a direction from said first end to said second end that includes at least portions of said second length and said third length of said inner wall sections, and said ~~second~~ at least another one of said plurality of filter media section sections traverses said second annular flow director.

Claim 29 (original): A system including the filter cartridge assembly of claim 23, in combination with a fluid circulating device, wherein said device has an outlet and an inlet, said entrance port is in fluid communication with said outlet, and said exit port is in fluid communication with said inlet.

Claim 30 (currently amended): A method of preparing the assembly of claim 23, comprising:

providing said tubular housing;

sealing one of said first and second end connectors to said tubular housing;

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introducing ~~a first of~~ at least one of said plurality of said filter media sections into said tubular housing;

settling said ~~first~~ at least one of said plurality of filter media section sections in said tubular housing; and

sealing the other of said first and second connectors to said tubular body.

Claim 31 (new): The assembly of claim 1, wherein said filter media composition in at least two of said filter media sections is different from each other.

Claim 32 (new): The assembly of claim 1, wherein said plurality of filter media sections comprises an activated carbon section, an immobilized enzyme section, a powdered alumina section, a zirconium phosphate section, and a sodium zirconium carbonate or a mixture of hydrous zirconium oxide of the acetate form and sodium zirconium carbonate section, in any order.

Claim 33 (new): The assembly of claim 1, wherein said plurality of filter media sections includes an arrangement, starting from said first end and ending with said second end, an activated carbon section, an immobilized enzyme section, a powdered alumina section, a zirconium phosphate section, and a sodium zirconium carbonate or a mixture of hydrous zirconium oxide of the acetate form and sodium zirconium carbonate section.

Claim 34 (new): The assembly of claim 1, wherein said at least one of said plurality of filter media sections comprises a sodium zirconium carbonate.

Claim 35 (new): The assembly of claim 1, wherein said at least one of said plurality of filter media sections comprises a zirconium phosphate.

Claim 36 (new): The assembly of claim 22, wherein said filter media composition in at least two of said filter media sections is different from each other.

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Claim 37 (new): The assembly of claim 22, wherein said plurality of filter media sections comprises an activated carbon section, an immobilized enzyme section, a powdered alumina section, a zirconium phosphate section, and a sodium zirconium carbonate or a mixture of hydrous zirconium oxide of the acetate form and sodium zirconium carbonate section, in any order.

Claim 38 (new): The assembly of claim 22, wherein said plurality of filter media sections includes an arrangement, starting from said first end and ending with said second end, an activated carbon section, an immobilized enzyme section, a powdered alumina section, a zirconium phosphate section, and a sodium zirconium carbonate or a mixture of hydrous zirconium oxide of the acetate form and sodium zirconium carbonate section.

Claim 39 (new): The assembly of claim 22, wherein said at least one of said plurality of filter media sections comprises a sodium zirconium carbonate.

Claim 40 (new): The assembly of claim 22, wherein said at least one of said plurality of filter media sections comprises a zirconium phosphate.

Claim 41 (new): The assembly of claim 12, wherein said filter media composition in at least two of said filter media sections is different from each other.

Claim 42 (new): The assembly of claim 12, wherein said plurality of filter media sections comprises an activated carbon section, an immobilized enzyme section, a powdered alumina section, a zirconium phosphate section, and a sodium zirconium carbonate or a mixture of hydrous zirconium oxide of the acetate form and sodium zirconium carbonate section, in any order.

Claim 43 (new): The assembly of claim 12, wherein said plurality of filter media sections includes an arrangement, starting from said first end and ending with said second end,

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an activated carbon section, an immobilized enzyme section, a powdered alumina section, a zirconium phosphate section, and a sodium zirconium carbonate or a mixture of hydrous zirconium oxide of the acetate form and sodium zirconium carbonate section.

Claim 44 (new): The assembly of claim 12, wherein said at least one of said plurality of filter media sections comprises a sodium zirconium carbonate.

Claim 45 (new): The assembly of claim 12, wherein said at least one of said plurality of filter media sections comprises a zirconium phosphate.